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Rainfall variability and extremes over southern Africa: assessment of a climate model to reproduce daily extremes

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It is increasingly accepted that that any possible climate change will not only have an influence on mean climate but may also significantly alter climatic variability. A change in the distribution and magnitude of extreme rainfall events (associated with changing variability), such as droughts or flooding, may have a far greater impact on human and natural systems than a changing mean. This issue is of particular importance for environmentally vulnerable regions such as southern Africa. The subcontinent is considered especially vulnerable to and ill-equipped (in terms of adaptation) for extreme events, due to a number of factors including extensive poverty, famine, disease and political instability.

Rainfall variability and the identification of rainfall extremes is a function of scale, so high spatial and temporal resolution data are preferred to identify extreme events and accurately predict future variability. The majority of previous climate model verification studies have compared model output with observational data at monthly timescales. In this research, the assessment of ability of a state of the art climate model to simulate climate at daily timescales is carried out using satellite derived rainfall data from the Microwave Infra-Red Algorithm (MIRA). This dataset covers the period from 1993-2002 and the whole of southern Africa at a spatial resolution of 0.1 degree longitude/latitude. The ability of a climate model to simulate current climate provides some indication of how much confidence can be applied to its future predictions.

In this paper, simulations of current climate from the UK Meteorological Office Hadley Centre's climate model, in both regional and global mode, are firstly compared to the MIRA dataset at daily timescales. This concentrates primarily on the ability of the model to simulate the spatial and temporal patterns of rainfall variability over southern Africa. Secondly, the ability of the model to reproduce daily rainfall extremes will be assessed, again by a comparison with extremes from the MIRA dataset.